

WHAT IS CLAIMED IS:

1. A pigment composition comprising one or more inorganic base particles and one or more substantially spherical shaped spacer particles deposited thereon, the pigment composition having a particle size range between about 0.1 and about 0.5 microns.
2. A pigment composition according to claim 1, wherein the base particles are anatase or rutile titanium dioxide.
3. A pigment composition according to claim 2, wherein the substantially spherical shaped spacer particles are calcium carbonate, silica, alumina, zirconia, titania or combinations thereof.
4. A pigment composition according to claim 3, further comprising a surfactant.
5. A pigment composition according to claim 4, wherein the surfactant is selected from the group consisting of polyacrylic acid homopolymers, polyacrylic acid copolymers, and mixtures thereof.
6. A pigment composition according to claim 5, wherein the surfactant comprises a polyacrylic acid homopolymer or copolymer comprising at least one comonomer selected from the group consisting of maleic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid, acrylamide, acrylonitrile, ethylene, propylene, styrene and esters of the acids, wherein the homopolymer or copolymer has been partially or completely neutralized with a neutralizing agent having a monovalent group.
7. A pigment composition according to claim 4, wherein the surfactant is a phosphate compound selected from the group consisting of tetrapotassium pyrophosphate, sodium polyphosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate, sodium hexametaphosphate, phosphoric acid, and mixtures thereof.
8. A pigment composition according to claim 4, wherein the spacer particles have a particle size range between about 0.005 and about 1 micron.

9. A pigment composition according to claim 4, wherein the spacer particles are silica and have a particle size range between about 5 and about 50 nanometers.

10. A pigment composition according to claim 4, wherein the spacer particles are calcium carbonate and have a particle size range between about 0.1 and about 1 microns.

11. A pigment composition comprising one or more titanium dioxide base particles, one or more substantially spherical shaped calcium carbonate particles deposited thereon and a surfactant, the pigment composition having a particle size range between about 0.1 and about 0.5 microns.

12. An inorganic composition comprising one or more substantially spherical shaped inorganic particles, the particles having a size range between about 0.1 and about 1 micron.

13. An inorganic composition comprising one or more substantially spherical shaped calcium carbonate particles, the particles having a size range between about 0.1 and about 1 micron.

14. A method of preparing pigment particles comprising the steps of:
(a) preparing an aqueous slurry of base pigment particles;
(b) adding a surfactant and one or more spacer precursors to the slurry; and
(c) precipitating the one or more spacer precursors on the base pigment particles under conditions so as to form substantially spherical shaped spacer particles on the base pigment particles, the base pigment particles having a particle size range between about 0.1 and about 0.5 microns.

15. A method according to claim 14, wherein the base pigment particles are anatase or rutile titanium dioxide.

16. A method according to claim 14, wherein the spacer particles are calcium carbonate, silica, alumina, zirconia, titania or combinations thereof.

17. A method according to claim 14, wherein the surfactant is selected from the group consisting of polyacrylic acid homopolymers, polyacrylic acid copolymers, and mixtures thereof.

18. A method according to claim 14, wherein the surfactant comprises a polyacrylic acid homopolymer or copolymer comprising at least one comonomer selected from the group consisting of maleic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid, acrylamide, acrylonitrile, ethylene, propylene, styrene and esters of the acids, wherein the homopolymer or copolymer has been partially or completely neutralized with a neutralizing agent having a monovalent group.

19. A method according to claim 14, wherein the surfactant is a phosphate compound selected from the group consisting of tetrapotassium pyrophosphate, sodium polyphosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate, sodium hexametaphosphate, phosphoric acid, and mixtures thereof.

20. A method according to claim 14, wherein the substantially spherical shaped spacer particles has a particle size range between about 0.005 and about 1 micron.

21. A method according to claim 14, wherein the substantially spherical shaped spacer particles has a particle size range between about 5 nanometers to about 50 nanometers.

22. A method according to claim 14, wherein the substantially spherical shaped spacer particles has a particle size range between about 0.1 and about 1 micron.

23. A method of making substantially spherical calcium carbonate particles comprising adding a surfactant to a source of calcium carbonate to obtain substantially spherical calcium carbonate particles.

24. A method of making substantially spherical calcium carbonate particles comprising adding carbon dioxide to a mixture comprising lime, water, and a surfactant to obtain substantially spherical calcium carbonate particles.

25. A pigment composition comprising one or more titanium dioxide base particles, one or more substantially spherical shaped silica particles deposited thereon and a surfactant, the pigment composition having a particle size range between about 0.1 and about 0.5 microns.

26. A pigment composition according to claim 25, wherein the base particles are anatase or rutile titanium dioxide.

27. A pigment composition according to claim 25, wherein the silica particles are hydrous silica.

28. A pigment composition according to claim 25, wherein the surfactant is a phosphate compound.

29. A pigment composition according to claim 28, wherein the phosphate compound is tetrapotassium pyrophosphate, sodium polyphosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate, sodium hexametaphosphate, phosphoric acid, and mixtures thereof.

30. A method of preparing titanium dioxide pigment particles comprising the steps of:

- (a) preparing an aqueous slurry of base titanium dioxide particles;
- (b) adding a surfactant and a source of calcium carbonate to the slurry; and
- (c) precipitating calcium carbonate on the base titanium dioxide particles under conditions so as to form substantially spherical shaped calcium carbonate particles on the base titanium dioxide particles, wherein the base titanium dioxide particles have a particle size range between about 0.1 and about 0.5 microns.

31. A method according to claim 30, wherein the surfactant is selected from the group consisting of polyacrylic acid homopolymers, polyacrylic acid copolymers, and mixtures thereof.

32. A method according to claim 31, wherein the surfactant comprises a polyacrylic acid homopolymer or copolymer comprising at least one comonomer selected from the group consisting of maleic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid, acrylamide, acrylonitrile, ethylene, propylene, styrene and esters of the acids, wherein the homopolymer or copolymer has been partially or completely neutralized with a neutralizing agent having a monovalent group.

33. A method according to claim 30, wherein the surfactant is a phosphate compound selected from the group consisting of tetrapotassium pyrophosphate, sodium polyphosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate, sodium hexametaphosphate, phosphoric acid, and mixtures thereof.

34. A method of preparing pigment particles comprising the steps of:

- (a) preparing an aqueous slurry of base titanium dioxide pigment particles;
- (b) adding a surfactant and one or more silica spacer precursors to the slurry; and
- (c) precipitating the one or more silica spacer precursors on the base pigment particles under conditions so as to form substantially spherical shaped silica spacer particles on the base pigment particles, the base pigment particles having a particle size range between about 0.1 and about 0.5 microns.

35. A method according to claim 34, wherein the base pigment particles are anatase or rutile titanium dioxide.

36. A method according to claim 34, wherein the silica spacer particles are hydrous silica.

37. A method according to claim 34, wherein the surfactant is selected from the group consisting of polyacrylic acid homopolymers, polyacrylic acid copolymers, and mixtures thereof.

38. A method according to claim 37, wherein the surfactant comprises a polyacrylic acid homopolymer or copolymer comprising at least one comonomer selected from the group consisting of maleic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid, acrylamide, acrylonitrile, ethylene, propylene, styrene and esters of the acids, wherein the homopolymer or copolymer has been partially or completely neutralized with a neutralizing agent having a monovalent group.

39. A method according to claim 34, wherein the surfactant is a phosphate compound selected from the group consisting of tetrapotassium pyrophosphate, sodium polyphosphate, tetrasodium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate, sodium hexametaphosphate, phosphoric acid, and mixtures thereof.

40. A method according to claim 34, wherein the substantially spherical shaped silica spacer particles have a particle size range between about 5 and about 50 nanometers.

41. A paint, plastic or paper comprising the pigment according to claim 1.

42. A paint, plastic or paper comprising the pigment according to claim 11.

43. A paint, plastic or paper comprising the pigment according to claim 25.

44. A paint, plastic or paper comprising the pigment made by the method according to claim 14.

45. A paint, plastic or paper comprising the pigment made by the method according to claim 30.

46. A paint, plastic or paper comprising the pigment made by the method according to claim 34.

47. A paint, plastic or paper comprising the composition according to claim 12.

48. A paint, plastic or paper comprising the composition according to claim 13.

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